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DEVOTED TO PHOTOGRAPHY IN ITS WIDEST SENSE

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CONTENTS.

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INDEX TO ADVERTISEMENTS.

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HOT WEATHER TROUBLES.

FRANK WONDERLY.

THANKS to the perfection which has been attained in the manufacture of dry plates, there is not that susceptibility to pucker and frill which was the great annoyance to manipulators during the heated term, still precautions must be taken, especially when the hot atmosphere is accompanied with considerable amount of humidity, and recourse is had at least to prophylactic measures to allay our fears of a probable encounter with this annoying attack on the beautifully developed negative. The usual preventive agent employed is chrome alum, which is generally placed in the fixing bath. This chemical is effective, and especially so if combined with a small amount of citric acid, which prevents any liability of stain. The chrome alum solution should not be too strong, and we practically prefer to bathe the plate after rinsing off from the developer in the solution rather than adding the chrome alum to the hypo, as we have sometimes by the latter plan produced deposit upon our negatives. Ice is indispensable during development in hot weather. All the solution should be cold, and I believe it unnecessary to wash the negative longer than half an hour in running water. In the employment of the chrome alum as hardener I have sometimes found that when required to subsequently intensify or reduce the plate the process was attended with unevenness, patches not re-

sponding readily to the intensifier or reducer. This calamity I have never met with when I employed formaldehyde or formaline, to harden the film ; but formaline demands a beter washing after development than chrome alum, a mere rinse or none being sufficient in the latter case ; while if not sufficient washing to get out the developer, especially if it be pyro, is not done an indelible yellow stain is the consequence. But formaldehyde is an invaluable hardener, and can be employed indefinitely without deterioration, and therefore it is recommended in connection with use of cold water during development and with the first washing. The plates will stand considerable rough treatment afterwards. I would caution against employing it too strong. A dilute solution acts as effectually as hardner, whilst if strong the film is sometimes liable to crack off in portions and leave the glass. One drachm to 16 ounces water is about the proper strength. Films require a little more care in handling. A small amount of glycerine should be added to the last wash water, from which they should be hung up to dry without rinsing.

In plantinum printing in hot weather, unless accompanied with much moisture, there is not demanded much particular attention, except in using the developing solution more dilute than in cold weather, the chemicals acting much more energetically. The developing should be done as soon as possible after printing, otherwise there is a tendency to flatness. It is more difficult to secure the velvety black tones in summer ; the inclination is to a bluish black, but the weakening of the developer and immediate developing after printing will ensure beautiful tones. The aristo papers, that is, those of good grade, are not troublesome in hot weather, except to keep the solution somewhat colder with the aid of ice. In bromide work and albumen printing blistering after removal from hypo may be prevented by allowing water to flow gradually in the hypo solution after fixing has been completed, until all the hypo is washed out and nothing but water remains. They may then be removed to the washing tank without fear of pustules. A little salt should be added to the water a few minutes before removal to the washing tank. I might have said, under head of negative treatment, that amateurs should

remember that less alkali is needed in development during hot weather, and that he should be cautious in its use, if desirous of securing the right density, and so not prolong development with the risk of pitting the film.

HOT WEATHER CARBON PRINTING.

ERNEST HECKROTH.

THIS is the time of year when frilling, blisters and reticulation are added to the trials of the carbon printer, and when a little seasonable precaution will greatly reduce the amount of trouble which "Old Sol" seems to take delight in causing us.

During the winter, with the atmosphere clear, and when there is plenty of fresh air, the paper drys harder and more crisp than in summer, when the extreme heat always causes more or less dampness in the air, and the paper, when dry, remains limp. Paper when limp has one advantage over hard dried paper, and that is, that it will lie flat in the printing frame without extra pressure. On the other hand, paper which dries hard and crisp will leave the original support with more ease, will adhere to the next support better and will develop quicker than paper which dries limp. So, of the two ways, we should choose that which possesses the greatest advantage, and accordingly our object in summer should be to dry the paper just a little harder and crisper than is wont.

First of all, the drying room should have a free current of air with a vent at each end; should be away from wet tanks and dishes of water, and should have a little chloride of calcium placed in a saucer in the room, to absorb the moisture therein. The addition of a little alcohol to the sensitizing solution will help the paper to dry at a high temperature; a little ammonia will keep the paper soluble, and some salicylic acid will go a long way towards preventing reticulation. A very desirable sensitizing solution is made up as follows:

Potassium Bichromate,	2 ozs.
Water,	100 ozs.
Alcohol,	4 ozs.

Ammonia, ... 1 oz.
Salicylic Acid, ... 100 grs.

This solution when in use must, of course, be made cold with ice, to prevent the gelatine from dissolving and running in streaks from the paper.

If a print should be over-printed, and must be left in very hot water for a long time in order to reduct to proper shade, trouble will surely ensue ; therefore in printing—even if a test-print must first be made on a small piece of paper—try and give as near the correct exposure as possible, so that the developing can be done in water not over 112°. The water in which the exposed tissue is wetted (before transferring) should also be cool.

Carbon printing cannot be done with the same reckless haste these days as in winter, but with a little extra care it can be done just as successfully.

AN EXCELLENT COPYING PAPER FOR ENLARGEMENTS.

DR. HALLENBECK.

BROMIDE paper is, of course, excellent for enlargements, but its price is excessive, and one loses much when the proper exposure is not hit upon, and to doctor a print is out of the question, if time has not been correctly estimated ; besides I consider the paper in market too sensitive for ordinary work, being better adapted for printing by contact, for which it is admirable, though not equal to platinum.

The following formula for making paper at home at a nominal cost may be acceptable to those who are enterprising enough to do their own work and not depend for everything on the manufacturer, and complain when they are charged for the labor, which charge is just, as the maker cannot be expected to furnish paper, and take blame for failures at a little above cost of chemicals. Make your own paper—it is not very irksome, and need not interfere with your other arduous duties.

Take a large plate of glass, make it perfectly clean with talc. Warm the plate before you pour the emulsion, the plate being perfectly level. Take sheets of paper of the best quality, wet them in distilled water and drain off well and squeegee down to the emulsion gently and dry with moderate heat. After the paper is thoroughly hard, cut round the edge and lift carefully from the plate.

The emulsion is made as follows :

FOR BLACK TONES.

Gelatine,	15 grms.
Bromide potassium,	9 grms.
Water,	150 cc.m.
Nitric acid,	2 minims.

To this 11.2 grammes of silver nitrate, dissolved in 150 cc.m. distilled water. The mixture is kept at a temperature of 30° C. for thirty minutes or an hour, according to the degree of sensitiveness required ; allowed to set ; cut up ; washed in the usual way ; remelted before pouring on the plate.

The above plan gives beautiful glossy surface.

If a matt surface is desired, the paper should be a trifle larger than the glass plate, clipped at the corners and turned under the edges of the plate and gummed beneath. The emulsion may then be applied directly to the paper by means of a glass rod, and dried as directed.

FOR BROWN TONES.

Gelatine,	15 grms.
Bromide potassium,	7.5 grms.
Iodide potassium,	1.6 grms.

Dissolved in 150 cc.m. distilled water, to which 2 minims of nitric acid C. P. is added. To this add—

Nitrate of silver,	11.2 grms.
Distilled water,	150 cc.m.

and proceed as above.

These papers are for enlargements or contact printing, but are intended especially for enlargements.

The development may be effected with oxalate and iron, but then a clearing bath is necessary. Hydrochinone and Eikonogen is preferable, as there is no liability to stain, the paper after development requiring merely a rinse off before fixing in hypo, which should not be very strong.

ENLARGED NEGATIVES.

I WONDER why those photographers who combine enlargement work with their other regular photographic business do not have recourse to making enlarged negatives and printing the enlarged copy directly therefrom instead of copying from a small negative. When one counts the expense of artistic work demanded by a first-class enlargement to make it acceptable to the patron, the labor bestowed upon a large negative is not much more expensive, and the results obtained are far more desirable ; then, if a number of copies are required, as in copying paintings or engravings, the cost is greatly less.

Make a transparency the full size required, either by collodion or with gelatine plate, perhaps gelatine is preferable here. All the artistic work can be done on this positive and it may be made much better than the original. A hard negative can be made soft and harmonious and a too flat one may be given pluck and vigor. I shall not trouble you here with the method of improving from the negative in the reproduction, as Mr. W. H. Rau has described his plan in his paper to your journal on the " Reproduction of Negatives " in the June number. Follow his instructions and you cannot fail to succeed. Suppose you want to make a vignette head, say from a cabinet. Wipe off all retouching completely and set up the negative in the frame, and make the enlargment in the camera up to the desired size. Sharp focus, intensely sharp, is demanded ; give full exposure, and develop with a rather diluted developer, and let the image be covered except the highest lights, and you will be delighted with a positive rich in gradations from the highest light to the deepest shadow. If it should need any intensification or a slight reduction, let it be

done now. When washed and dried it is ready for the retouching. You can see better in this enlarged form where to apply the artistic work in deepening the shadows, in giving a touch of decision here and there or scratching out a too dense spot, and, being a positive, you have before your eye the exact appearance of the picture, with its correct lights and shades, as it appears in the original picture, not the reverse, as in a negative, which might confuse even an expert at times. You see exactly a counterfeit presentment of the original. Now having the improved, enlarged positive, all that is necessary is to make a negative therefrom. I prefer making the negative in the camera, as thereby the retouching on the positive is not discernible, as it might be if made by contact. Focus to the size you desire, but do not focus too sharply this time, this is to prevent prominence to the retouching ; I do not mean to get 'way out of focus, like the fuzzy school. A very slight turn of the focussing screw will obliterate all the touches of the pencil without spoiling the negative. Give full exposure, and use a more vigorous development than on the positive, as the object is to get a plucky, good printing negative. If necessary strengthen, but be careful not to clog up the shadows. This negative will not need much retouching ; the lights may require a strengthening touch, but the gradations ought to have been secured on the positive.

I am indebted for this excellent method to my friend, Mr. George Hammer Croughton, who is the originator ; at least he was the first to make it public, although he has not always received credit for it. I know of nothing to equal it for reproduction of paintings and other high artistic work, and when the carbon process is applied for the resulting prints, it is simply perfection. The work cannot be told, even by experts, from original full size pictures.

J. B.

PRINTING ON SILK.

To prepare the silk for printing, immerse for a few moments in a solution composed as follows :

Alcohol,	1000 parts.
Benzoin,	8 parts.
Mastic (in tears)	5 parts.
Chloride of Cadmium,	30 parts.

Allow the silk to dry, then sensitize in the following solution :

Nitrate of Silver,	120 parts
Water (filtered),	1000 parts

Dry and iron the silk ; print as usual with albumen paper, but with care in watching the progress of printing, so that in lifting the silk from the negative blurred lines do not result.

When sufficiently printed, wash well in five changes of water, and tone in any toning-bath, which, however, must be diluted by the addition of water equal in quantity to the volume of the bath used. M. Schaeffner recommends the subjoined toning-bath as specially adapted to this process :

Pure water,	1000.00 c.c.
Chloride of Gold,	0.25 grammes.
Bicarbonate of Sodium,	2.50 grammes.

This bath should be prepared several hours before use. The silk prints should be kept moving while toning. When toned, immerse for a moment in a bath of clear water, and fix in

Water, 1000 parts. Hyposulphite of Sodium, 100 parts.

for ten minutes. Wash afterward for a few hours in running water, dry in the air, and afterward with an iron press the silk prints while they are slightly damp.

To finish these prints in monochrome or colors, dilute the color used in the solution of one part of alum in ten parts of water.

Here is a formula for sensitizing cotton, silk, or wool fabrics, or canvas for painting, so that prints may be made from photographic negatives upon them as a guide for decorative work :

Ammonium Chloride,	2 grammes.
Water,	250 c.c.
Whites of two eggs.	

When dry, sensitize by floating upon a 60 to 70-grain nitrate of silver bath. Tone, fix, etc., as usual.

SOME PRACTICAL SUGGESTIONS ON PLATINUM PRINTING.

L. C. HIGGINS.

THE red color of the image by silver not being pleasing to the artistic eye was very soon modified by gold-toning, whereby, in the employment of particular agents for neutralizing the activity of the gold—borax, lime, acetate soda, carbonates, etc.—the color was changed to purple, brown, sepia and black.

The black tone, for some reason or other (probably because our eye has been trained to an appreciation of it in the examination of engravings) has always been a favorite, and photographers here sought for some method to imitate the engraving tone. This may be secured in albumen silver printing, and in the aristotype papers by the so-called aristo-platinum printing and in bromide paper, but in silver printing processes it is thought that the black tones are produced by sulphur, and doubts arise as to their permanency.

But undoubtedly the most beautiful black tones, than which nothing can go beyond, are to be had so far only with platinum ; and for the perfection of the method of platinum printing, as now practiced, we owe almost everything to Mr. W. Willis.

Many attempts, from the beginning of photography, had been made to utilize platinum. As early as 1832 Sir John Herschell found that the ferric salts were reduced to the ferrous state by the action of light. There are several interesting attempts to use platinum for printing recorded in Hunt's interesting " Researches on Light," published in 1840, but the only really practical plans are those of Mr. Willis, and Pizzighelli.

Platinum paper may be had ready made, but there is no reason why one should not make it just as silver albumen paper is made.

It requires great care to preserve platinum paper from the action of damp atmosphere. It is best kept in tin tubes at one

end of which a piece of chloride of calcium is placed, which chemical has a strong avidity to absorb moisture from the air. The tubes also should be sealed with a rubberband. When the calcium chloride becomes moist from imbibation, fresh should be supplied ; the water may be driven off from the chloride of calcium by heating it to redness. Paper, however, does not keep much beyond a month, even when precautions are taken.

The chief difficulty is in estimating the proper degree of printing, for the image is not fully printed-out but only partially, the impression being a sort of olive color on the yellow ground of the platinum paper requires some judgment in determining the point at which to stop. If carried too far the print is flat and tame-looking, and if not carried far enough, of course lacks detail and half-tones. But the eye very soon becomes educated to the appreciation of the proper degree. Detail should be visible, but not detail in the high lights.

One cannot gaze too lovingly or long at the image in the frame, but one needs to retire behind the yellow window; but then this increases the difficulty in judging.

Preparation of the platinum paper.—Platinum paper is generally bought ready made. The formula for sensitizing is as follows :

1	Water, ...	500 cc.m.
	Ferric Oxalate, ...	7 grm.
2	Water	250 cc.m.
	Chlorate Potassa, ...	1 grm.
3	Water, ...	6 cc.m.
	Potassium Chloro-platinite, ...	1 gr.

For harsh negatives the quantity of iron-salt is increased, the amount of chlorate diminished, and the reverse procedure for soft negatives.

The coating must take place in very feeble light, preferably under yellow, but then it is hard to see the color (yellow) of the sensitiser. The paper may be fastened to a wooden board the same size, a small amount of the sensitizing solution poured on the centre and swabbed over with a tuft of cotton worked evenly

to the edges with a circular motion—the motion should be light and gentle, the object being to secure uniformity. Much care is necessary in the drying. As soon as the sheet has been coated it should be hung up until the surface moisture has disappeared, then dried quickly as possible before a stove or over a gas-burner flame, care being taken not to scorch it. The color, by action of heat, changes from lemon to a much darker tint.

A little time (about five minutes) should be allowed to elapse between the sensitizing and the drying. If the paper is dried too soon after sensitizing the image will wash off in the developer, if not dried quickly enough the image will be flat. If the air is very dry the surface moisture sometimes will dry too rapidly (in a minute or two) but then the atmosphere of the drying-room should be made moist by sprinkling the floor with water, or the paper may be put in a closet with a pail of water.

The developing is effected as soon as possible (especially in summer time) after the printing. If it is impossible to develop immediately on removal from the frame, the prints should be put back in the calcium tubes and be attended to as soon as possible.

The print is developed by taking one end of it in the hand and placing the other end upon the solution, pushing the paper slowly and evenly over the liquid, the object being to get uniform contact of print and developer. If development has not proceeded far enough the print may be returned until the detail is out and the proper depth reached, when the operation must be checked at once by placing the print in a weak acid bath—acetic acid or hydrochloric and water (1-50). After remaining in this five minutes, remove to a second clearing bath, same strength, and if any yellow tinge this bath a third will be necessary. A final wash in clear, running water ; 15 minutes or a half-dozen changes of water is sufficient. The object of the clearing bath is to prevent the precipitation of the salts of iron in the fibre of the paper. On its complete removal the permanency of the platinum print depends. Developing is done in a feeble white light.

The formulæ for making the ferric oxalate we give you, for the constitution of the developer you may ask the inventors of the

process ; they call it developing salts. It is oxalate of potassa with a percentage of the platinum salt.

After the exposed print has been twice floated as recommended above, it should be held in the hand face upwards and watched for the appearance of the half-tones. When these have appeared and the granulated look the print had at first has disappeared and the shadows have the right intensity, the print should be put immediately in the acid solutions and moved about.

Formulæ for making ferric oxalate.—Ferric chloride, 32.5 grms are dissolved in 400 cc.m water, and when the solution has been brought to the boiling point, solution of caustic soda is added until it gives with litmus a decided alkaline reaction. About 16 grms. is necessary of caustic soda. The precipitate is washed with hot water, allowed to settle and then decanted until the washing water is no longer alkaline. It is now pressed through a cloth to get rid of as much of the water as possible, and the syrupy mass mixed with about 13 grms. of finely crystalized oxalic acid and the mixture left to itself for a few days at a temperature of not more than 30° C., and protected from light. The formation goes on gradually. At first the solution has a pure green color, by continued boiling it turns yellowish-green and finally greenish-brown. At this last stage filter off the hydrate of iron remaining. The amount of ferric oxalate may be estimated by evaporating an ounce, heating it to redness with nitrate ammonia and weighing the ferrous oxalate which remains. The liquid is then diluted with water so that every ounce of it may contains 7 grms. of ferric oxalate. Crystalized oxalic acid is then added until with the free acid already in the mixture, the acid amounts to about 8 per cent. of the ferric oxalate already formed. However, if one does not care to make ferric oxalate, the chemist will readily supply it. Our object in this paper is merely to induce you to take up platinum printing. With a little pains, care and judgment, you will very soon make work which will delight you with its beauty, and you will never again say that you can get platinum effect with Aristos, or maintain that bromide paper equals the soft, delicate gradations which this process offers for the little trouble it requires

SOME OBSCURE PHOTOGRAPHIC PHENOMENA.

W. J. RUSSEL, F.R.S.

HAVING some years ago prepared, for the purpose of spectroscopic examination, several uranium compounds, it became of interest to make further use of them by repeating some of the very important experiments which Becquerel has made with these compounds. He has shown that, if the metal or some of its salts be placed on a photographic plate in perfect darkness and allowed to remain there for some days, the plate becomes acted on, the action being rendered evident by the ordinary photographic process of development. This action is readily produced, and belongs apparently to all the salts of this metal, and as Bequerel has shown, to uranous, as well as uranic, salts.

It is very remarkable that this power belongs also to the salts when in solution, and, as the action passes through glass, solutions of the double chloride or of the nitrate contained in a thin glass bottle, when placed on a photographic plate, act readily upon it. While speaking of these compounds it may be well to record some experiments which have been made to determine whether they lost their peculiar activity on being kept in the dark.

On August 10th last, specimens of yellow oxide, recrystallized nitrate, and chloride, the latter in solution, were each divided into two equal portions, and all placed in similar clean, thin glass bottles. One sample of each was then placed in total darkness, and the other kept in the light. These samples have from time to time been tested by placing them on a photographic plate for a week and then developing the plate in the usual manner. Seven such examinations have been made at about one month's interval. No very marked difference between the samples in the light and the dark has occurred ; on the whole, the samples preserved in the dark have proved slightly the most active, and this was decidedly the case with all three specimens at the last examination on March 26th.

Another experiment was begun a little later with the black oxide of uranium, which appears to be one of the most active of the uranium compounds. Equal weights of a sample of this body

were placed in two similar pill-boxes with a glass bottom ; one has been kept in the dark, and the other in the light : after five months there was no difference in the effect which they produced on the photographic plate. The experiments are being continued.

When repeating these different uranium experiments, and using a card painted with the yellow oxide, perforated zinc was made use of simply as a screen to show the activity of the uranium compound by the density of the picture of the pattern formed ; but, in place of obtaining in all instances a negative of the perforated zinc, i.e., the action occurring where the plate was exposed, and none where covered by the zinc, the reverse took place, and the greatest amount of action occurred underneath the zinc. This happened over and over again, and even when the experiment was varied in different ways, so that the only explanation of the action was that the zinc itself must be able to effect a change of the same kind as the uranium, at all events to act on a photographic plate ; and further experiment with zinc alone proved this to be the case ; later on it became known to me that M. Colson had already described this action of zinc, and had also found that similar results could be obtained with cadmium and with magnesium. He explains this remarkable action as due to vapor given off by these metals.

Both before and after seeing the account of Colson's work a large number of experiments have been made with zinc under different conditions and there is no doubt of the ease and certainty with which the results can be obtained. The zinc, as Colson states, must be bright ; if well rubbed with coarse sandpaper it is most active ; probably this may, to some extent, arise from increase of surface ; if cleaned with acid or with caustic alkali it is not so active, and zinc in its ordinary condition after exposure to the air ceases to be active. The salts have also no power of acting in this way.

A polished piece of zinc laid on a highly sensitive photographic plate will, under certain conditions, even in four or five hours, so act on it that on development a complete picture of the zinc is produced, showing the scratches or any ruled lines or faint pat-

tern drawn on it ; or, if flaws in the metal exist, they are clearly seen. A slight pattern produced on zinc by pressing it on a piece of white net, and then rubbing it down with fine emery or sand paper, will give a picture in which the pattern is very evident. In fact, such a pattern forms a very satisfactory test of this action of the zinc. Very slight alterations of the surface are shown in the picture. Absolute contact of metal and plate is not necessary.

If screens of different thicknesses of any inactive substance be interposed between plate and metal, thus preventing contact, the action still occurs ; if the screen be very thin, a picture of the zinc surface is still obtained, but, if thicker, only a dark, cloudy patch is formed. Still further, if a thick piece of glass tubing an inch long be placed on a photographic plate, and the upper end covered with a piece of polished zinc, in a week to a fortnight distinct action will be found to have taken place below the zinc.

Since the action, then, is not one of mere contact, the next point was to ascertain whether it would be transmitted through different solid or liquid media. Glass, even of the thinnest kind, was found to stop the action, but many other substances allow of its transmission. For instance, the action takes place readily through celluloid, sheet gelatine, gutta-percha tissue, collodion, vegetable parchment, real parchment, goldbeaters' skin, tracing paper, and, no doubt, many other bodies. With all these bodies experiments have been made by placing the medium first in contact with the zinc and the photographic plate, then by introducing a screen so as to prevent the medium from touching the zinc, and then placing a second screen so that neither zinc nor plate were in contact with the medium. The screens were made of different materials, most commonly of either white cardboard or sheet india rubber, and of different thicknesses.

The details of each experiment need not be here described ; but the general results obtained are that with thin sheet gelatine, either red, green, or blue, when laid on the zinc, the action readily passes through, and a good, clear picture of the surface of the zinc is obtained, and even with two sheets of gelatine a similar effect is produced. With thick sheet gelatine interposed the

action on the plate still takes place, but, of course, the exposure must be longer. Warm solutions of gelatine were painted on polished zinc and allowed to harden; the action took place through such layers as readily as through the films. With screens used as before described, to prevent contact, the gelatine still allowed the action to take place through it.

Thin sheets of celluloid about 0.28 mm. in thickness allowed the action to take place through them, and sheets 0.81 mm. in thickness also allowed the action to be transmitted. Again, gutta-percha tissue was found to act in the same kind of way as the gelatine and celluloid. The other media experimented with, although possibly not so uniform and continuous in structure as the foregoing, also allow this action to be transmitted to them.

Goldbeater's skin and tracing paper both allow the action readily to pass through, and pictures of the zinc are readily obtained. If either of these bodies be placed between a piece of perforated zinc and the plate, the perforations are very distinctly shown, or, if they be placed between a double screen, with corresponding holes cut, a picture of the holes is readily obtained.

Both vegetable and real parchment are also transparent to this action, but not so much so as the previously mentioned substances; the vegetable parchment is more transparent than real parchment. When in contact with the zinc, a picture of the zinc surface is obtained, but this is somewhat modified by the substance of the parcment.

If different kinds of ordinary papers, such as writing and drawing paper, be interposed between polished zinc and a photographic plate, interesting results are obtained; for the pictures formed show clearly the structure of the papers, and also show that papers have very different powers of transmitting this action.

Certain writing papers are quite opaque to the action; with others, pictures of the structure and the water mark are easily obtained. The painting a paper with India ink does not destroy its transparency. And obviously pictures of bodies, such as skeleton leaves or dried flowers, etc., are easily obtained in this way.

A mere difference of color does not appear to alter the absorp-

tive power of a medium ; at least, this is the case with gelatine. The thin sheets of gelatine, whether red, green, or blue, have no difference in their absorptive power, and, when gelatine, colored with analine dyes, is painted on polished zinc, the color does not affect the amount of action which takes place. The same thing happens if demy paper be painted with different colored solutions of gelatine. With ordinary pigments different results are obtained, but these results need not be discussed on the present occasion.—" The Optician and Photographic Trades Review."

INDIRECT METHOD FOR REPRODUCTION OF COLOR IN PHOTOGRAPHY.

DR. J. M. EDER, VIENNA.

THE mixture of two pigments gives entirely different results from the mixture of the colors of the same name of the spectrum. The pigments which owe their color to reflected light do not correspond at all to the simple primary colors. Colored glass or films likewise do not represent the integrity of the spectrum color after which they are named.

These facts are to be borne in mind in the consideration of what follows. Let us take, for instance, the absorption spectra of indigo and of picric acid. We shall employ glass plates coated with gelatine films stained for the indigo with sulphate of indigo, which gives a very intense color, and stained for the yellow with picric acid, which is intensely yellow. If we place the blue stained screen before the spectrascope we shall perceive that the red, orange and yellow are absorbed, whilst the blue and violet are transmitted. On placing the picric acid stained film before the apparatus we note the absorption of some of the red and the blue, and the violet entirely; the orange-red, yellow and green being transmitted.

If the blue and yellow screens are superimposed, only more green light is transmitted, because a part of the color-rays are absorbed by the blue screen and a part by the yellow screen, the result being the transmission of the green.

Every child who has played with paints knows that the mixture of yellow and blue produces green, but the conclusion reached, that the mixing is the cause of the green, is erroneous. That such is not the case is easily shown by analysis by the spectroscope. The truth is (say, for instance, we have chrome yellow and Prussian blue) the green really is present in the individual colors before they are mixed ; the mixture causes it to manifest itself, the other component colors being neutralized by absorption.

It is exceedingly difficult to color glass of a suitable tint to approximate the subjective effects by superposition corresponding to the Young-Helmholz fundamental color areas of the eye : red, green, and blue-violet.

Let us superimpose two glasses, one coated with eosin collodion and the other made by fusing the glass with chromate of copper; and let us allow pure white light to pass through them and the result will be a beautiful golden yellow color. According to the old doctrine we learned in school of complimentary colors, we shall find it hard to explain this phenomenon, but it is clear enough by spectrum analysis. The eosin absorbs green and allows red, yellow, blue and violet to pass through. The chromate of copper glass on the other hand, absorbs red, orange-red and blue-violet, and allows yellow and green as well as blue-green to pass through. The union of the two absorptions of the colored media is red, orange, green, blue and violet, so that only more of the yellow of the spectrum is secured.

The employment of the three pigments, red, green and blue-violet makes it very difficult to represent the seven primary colors. Glass stained with these colors yield far better results.

Hering believes there are four primary colors : red, green, yellow and blue, and the truth is with these colors it is easier to represent the colors necessary for the three-color system of printing. In practice, red, yellow and blue are employed.

Hübl (" Photo Correspondenz," 1893) gives the following graphic scheme of the absorption of the three pigments, yellow, blue and red.

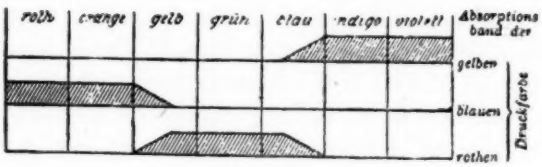


Fig. 3.

From this cut we see that much of the three colors absorbs another color area, and that all three together absorb the entire spectrum, and we have the absence of color or black.

If all three colors, red, yellow and blue, are superimposed (colored films) the resulting color is grey. Where the yellow and red come together we have orange ; from blue and yellow, green; but this mixed green is not brilliant. The need of bright, brilliant yellow is, therefore, compensated for by the mixture of the fundamental colors, red, green and blue-violet.

With red, yellow and blue it is possible to secure pretty good variations in color.

Now the question arises, How is the photographic plate for the three-color process obtained ?

The solution of the dominating color in the copy is obtained by the so-called color filter ; that is, the employment of colored screens which transmit only special rays. This screen is placed before the photographic objective, and secures thereby the holding back of certain colors so that only the minimum amount is able to penetrate. Similar results may be obtained by illumination of the colored originals by colored lights. For instance, if we illuminate a color-scale with yellow light, only those colors will be brilliantly illuminated which have yellow in their constitution, that is, reflect this particular light. Thus, if we use a sodium flame, we have the yellows, reds, orange as well as green, more or less bright according to the amount of spectrum yellow the pigments contain. In like manner we may filter out any special color by using the proper kind of screen. If we regard, for instance, a pure chrome yellow surface by white daylight and subjected to the analysis by the spectrascope, we find that it con-

tains not only spectrum yellow, but also some red, orange, green and blue-green, all the other spectral colors being absorbed by the white light. The yellow preponderating, though association with the other colors give us the impression of a uniform yellow light, although, as we have seen, it is quite a complicated color which the eye receives.

Prussian blue, which, in painting as well as in the technical arts, appears to us as a semi-transparent blue, is composed of a mixture of blue-violet, green and yellow-green together with the predominating blue. We say Prussian blue reflects blue, violet-blue, green, yellow-green, and absorbs red, orange and yellow and the ultra violet.

If we place a film of blue pigment over a film of chrome yellow, not all the colors reflected from the yellow pigment reach the eye ; they are absorbed by the film of blue. The red, orange, yellow are abstracted by the blue, and the result of the visual impression is green containing both blue-green and yellow-green.

The case is analogous in the mingling of blue and yellow pigments, a green resulting because the chrome hinders a part of the color reflection by absorption, the blue, another portion of color, keeps back, and only that portion of color is reflected to our eye which is not retained by both the pigments, hence the reflection of the green rays.

The water-color painter and oil painter have to take into consideration these facts to produce the required effect. They are well aware that every superimposed color takes away certain portions of color from the underlying tint, corresponding to its particular absorption properties.

These principles must be constantly borne in mind also by the printer of reproductions by the three-color process, else he will be constantly falling into error and will be unpleasantly surprised at the strange combinations resulting. Where red and yellow fall together all the varieties of orange arise, yellow and blue give rise to the variations of green, and red and blue to the gradations of violet tones. In this way all the rich gradations of a polychrome picture may be reproduced. The great desideratum for securing accuracy in the representation of the original colors is

to find the three colors which in their special tone, by combination, shall be able to reproduce the varieties of tints. Unfortunately the brilliant tar-colors are not sufficiently permanent, fading under the influence of light, and the majority of pigments, when examined spectroscopically, are found to be impure and turbid.

Three differently colored positives are superimposed, and the three-image impression is projected upon the screen. Here three slides are produced by proper filtration through special screens and are made upon flexible films and placed one over the other upon a glass support, care being taken that the different parts properly register.—" Wiener Photo Blaetter."

A New Developer.—M. M. Lumière and Seyewitz have made diamidoresorcine hydrochlorate by the action of sodium nitrite and hydrochloric acid on resorcine, and they find that this is a powerful developing agent without alkali. From many experiments they find that a normal developer is:

Diamidoresorcine hydrochlorate	1 part.
Sodium sulphite (anhydrous)	3 parts.
Water	100 parts.

By increasing the quantity of diamidorescine the images become less and less vigorous, and the developer does not act so vigorously. The same occurs when it is decreased. Increase of the sulphite increases the activity of the developer till ten per cent. has been used, and beyond this point there seems no increase, and fog is caused. The addition of an alkali, such as carbonate of soda, also increases the rapidity of development, but, if more than 8 parts of a ten per cent. solution of soda be added, fog is caused. Acids retard development, and, if added in sufficient quantity, entirely stop it, but they do not allow one to correct overexposure. Bromides act very energetically, and the addition of 1 part of a ten per cent. solution to 100 parts of developer produces instantly a marked effect. The solution keeps fairly well. This new reducing agent is very similar to amidol in its action, but is far more sensitive to the influence of bromides, and it is readily soluble in water, gives very soft results, with harmonious gradations in the half-tones.—*British Journal of Photography.*

ZINC ENAMEL PROCESS.

COUNT VITTORIO TURATI, MILAN.

AFTER the American Enamel Process had attained the popularity it so deserved, and had been worked out upon copper in its various modifications (fish glue, Cologne glue, metagelatine, etc.), many experimental attempts were made to employ zinc as a substitute on account of its cheapness.

But in the application of zinc the principal obstacle found was the change in the structure of this metal to the crystaline form at a temperature necessary for burning-in the glue-picture, and only indifferent results were obtained in the etching. To overcome this obstacle it was necessary to either produce the enamel film at a lower temperature or to find out a modification of the etching process capable of etching the zinc in its changed condition. In both directions a number of experiments were made.

Besides the published enamel process, the so-called cold-enamel processes were advertised for sale from various quarters ; but despite the public puffing of these methods, no one seems to have taken up with them in practice, it being found impossible by any cold method to attain to any power of resistance of the burnt-in glue enamel film.

The first publication concerning the enamel process on zinc, and its difficulties, was made in 1893, by Wilkinow, and W. Secker, in 1894 (Eders Jahrbuch, 1894.)

Husnik ("Photo Notiz," 1894, p. 164), recommended subjecting the zinc to a preliminary etching, with nitric acid 1 part, alum 1 part, water 20 parts. The plate was then prepared as usual with chromated glue, the image colored with an alcoholic solution of some coloring matter, and etched after the burning-in.

Another proposition was as follows : A colored shellac solution (in chloroform and benzole) is poured upon the copy, and after ten minutes washing, developed with a cotton wad. Husnik makes the remark that the heating of the zinc is here avoided, but the etching is coarser.

Concerning the action of colored resinous solutions, information is given in detail further on.

Liesegang recommends a somewhat round-about variation of the etching process, but the desideratum is to find a method to expedite the etching rather than to prolong it. Another process recommends the employment of chrome alum, but differs in no other respect from the copper process.

"The Photogram" (1894, July) treats of the zinc enamel process, but does not communicate much that is new. It attributes failure to the presence of lead in the zinc.

"The Photographische Correspondenz" (1895, pp. 57-106) publishes an article on zinc enamel, but without any special technical information.

An entirely new idea is described in "Anthony's Bulletin," (1895), by Macfarlane Anderson, in which resin is saponified and the acqueous solution neutralized. He mixes some of this with the fish glue preparation, and it is said to need only a weak heat to produce a resinous resist.

Hyslop describes a similar method, making use of a very fine resinous emulsion.

However excellent all the processes may seem at first glance, they have little practical value, as the author has proved by repeated experiments. He has succeeded even with pure chromated resin-soap in obtaining an image that fluxed with gentle heat and offered a complete protection from attack of acid.

Colin Campbell ("British Journal Almanac," 1895) recommends instead of fish glue (which requires too great a degree of heat, thereby modifying the structure of the zinc) other substances which give good enamel with much lower temperature as, for instance, sea weed (Fucus and Tangarten).

H. Miller published in "Photo Correspondenz," 1895, his experiments in this direction, using Carageen moss with good effect.

G. Fritz ("Photo Correspondenz") published in a paper read before the Vienna Photographic Society, 1895, his experiments in zinc enamel. The only novelty he presents is the increased amount of water he employs—25 per cent. more than in the copper process—on account of the greater porosity of the zinc.

In the burning-in he does not exceed 150° C., at which point the coloring matter disappears and the film turns yellow.

At this temperature, however, no enamel is produced, inasmuch as the enamel of the fish glue requires 280° C. The film then turns chocolate brown in color. For this reason a modification of the etching process is also demanded. Five grammes of nitric acid and 400 grs. alcohol. Forty per cent. is used for the biting, three to five minutes being necessary, according to the character of the image. The plate is immersed in a two or three per cent. aqueous etching bath and finally treated for two or three minutes to the first alcohol and nitric acid bath.

The operation requires from 40 to 50 minutes, and is said to give excellent results. The alcohol plays the part of protective agent to the glue, which is easily attacked by the aqueous etching bath (The same process is described in "Anthony's Bulletin," 1895, p. 336.)

July, 1895, Otto Muller, in "Photo Correspondenz," gives his experience with the zinc. His preparation is the same described above, only Muller takes fresh albumen instead of dried. The development is effected after treatment with stained solution of resin in chloroform and benzole. This resin solution, which we have noticed in the process described by Husnik, serves the purpose of forming upon the glue copy a resinous surface which permits the permeating of the watery developer, thereby washing out the coloring matter in its passage through the resinous film. The unexposed portions of the glue swell up, and breaks up the super-imposed layer of resin which has begun to decompose, and regularly dissolved out by the developing water. Gentle rubbing with cotton accelerates the operation.

The completely developed image consists of insoluble glue with superimposed resin, and is, by aid of gentle heat (melting point of the resin) united to a resisting skeleton).

As far as the author's knowledge extends, the application of such resinous color solutions was first published by E. Vallot (American Annual of Photography, 1893). He made use of an etherial solution of asphalt and methyl-violet. But the process is considerable older than 1893, having been employed by the

writer, but not published (albumen bitumen), and, indeed, in connection with the ordinary chromated albumen copy process on zinc. It is not easy to determine accurately the proportions of the solution, the following solution, however, gives excellent results : 3 grammes methyl-violet, 10 grammes Syrian asphalt, dissolved in 200 cc.m. chloroform ; to this is added gradually 400 cc.m. benzole absolutely free from water by aid of chloride calcium. The solution is let stand 48 hours, filtered, and the evaporated chloroform supplied with about 25 cc.m. new.

If the directions are accurately followed a solution is obtained which flows finely, forms no striæ, and dries down to a beautiful glossy homogeneous surface.

Summing up the variations of these processes we have :

1. Alteration of the zinc surface by preliminary etching. The plate is roughened to make the preparation attach itself.

2. Hardening of the emulsion film by incorporation of the resinous substance. These are either added to the preparation or applied as a film after the copying as a film. In both cases the hardening is effected by gentle heat (melting point of the resin).

3. Hardening of the glue film by tanning. Application of chrome alum, tannin, formalin, alcohol, etc., partly in the coating preparation, partly also in the acid. Variations of this kind have been tested by the author in greater part, and they are satisfying alone, but render other modifications of the process indispensable.

4. Employment of substances more easily influenced by the enameling. Sea weed and fuci which permit the enameling at a lower temperature.

5. Modification of the etching process. The employment of etching methods which do not too energetically attack the slightly enameled glue, and methods of etching which will smoothly etch the altered crystaline zinc (in high temperature enameling).

In the course of the years 1895 and 1896 further investigations in the zinc process were made.

The writer has already pointed out that the principal advan-

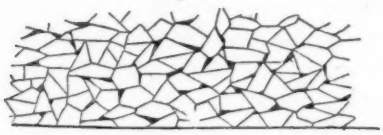
tage of the enamel process (wealth of half-tones) depends upon the appearance of the etching similar to the photogravure cliche, and the employment of copper itself as an especially suitable metal for etching purposes.

Recent studies show that likewise on the zinc the same advantages may be secured. The results here mentioned are all based upon the modification of the etching process.

A zinc print is burnt-in till it acquires an intense chocolate-brown color, and is then treated with a dilute chromic acid solution, which has an oxidizing and weak solvent action on the zinc. The basic zinc salt containing water formed secondarily in the little pits, affords, by its insolubility, the position of specific importance to the process.

If one takes the plate out of the chromic acid bath, it shows little action of the etching. If it is now immersed in a nitric acid

Fig. 1.



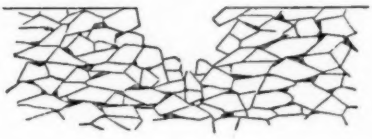
bath, the depth of the etching is apparent at once owing to the solubility of the zinc salt. If necessary this process may be repeated several times, but with practice one etching will be found sufficient.

To obtain a clear impression of the nature of this process, imagine in place of the zinc a crystalline, soluble cake of salt (fig. 1) on one portion of the smooth surface of which water is allowed to act.

The water will dissolve, first of all, the smallest crystal masses, and penetrating the interstices between the coarser crystals, the surfaces of which it merely dissolves and washes out, forming an irregular, rough crystalline cavity (fig. 2).

If the action of the water is retarded by the addition of colloid bodies such as gum, dexterine, etc., and also made turbid, forming a deposit during the solvent action, the fine passages will be filled up and the solvent action will proceed more gently and

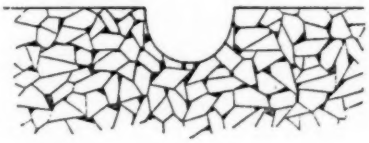
Fig. 2.



more within control, the crystal terminals thereby having time to dissolve before the clefts or crevices open too far. The hollow so formed will be different, rounder and smoother than when water alone is employed as solvent (fig. 3).

Having by such a method obtained a clear idea of the cause of the so-called rough etching, it was possible to work out a modi-

Fig 3.



fication of the ordinary process with nitric acid ; that is to say a means must be determined of converting the process to a mucilagenous precipitating process. This may be effected easily by adding gum, etc. to the etching fluid. Precipitate (Schlamm) may be produced in various ways (chemical as well as mechanical). The addition of various substances to the etching bath will produce a fine sediment during the etching, so that the valleys of the crystalline mass may be choked up and the points or sum-

mits of the zinc crystals uniformly dissolved away so that the etching process goes on smoothly and uniformly to the full depth.

An idea of this may be had by heating smoothly polished zinc nearly to the melting point, allowing it to cool, and then submitting it to the action of different acids. By the use of weak chromic acid one obtains an etching, whilst at the same time the surface is covered with precipitate of yellowish-brown basic

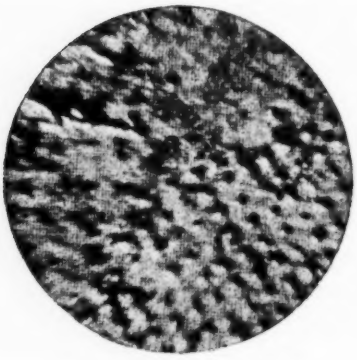


Fig. 4.

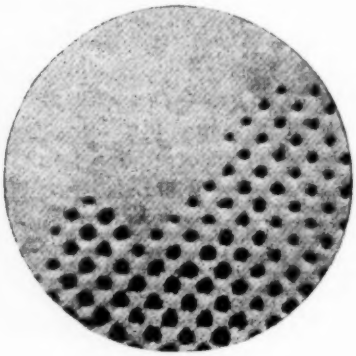


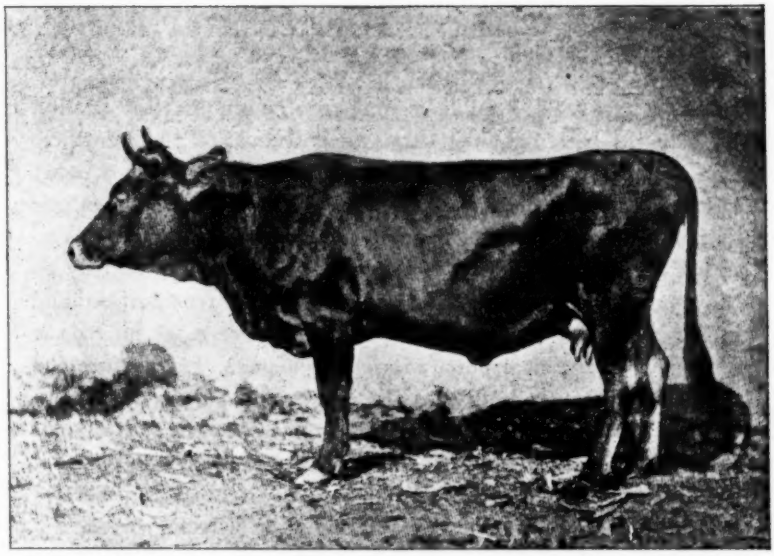
Fig. 5.

chromate of zinc. On wiping this precipitate away the etching ground is found to be quite smooth.

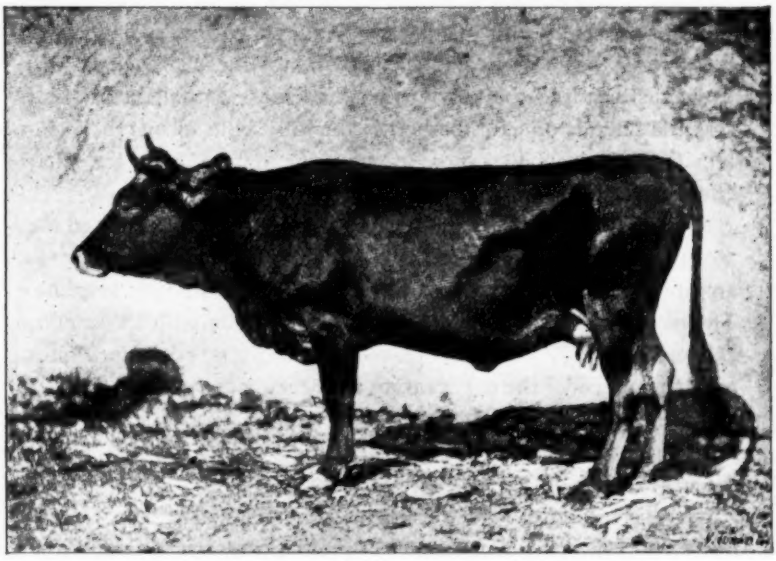
With ordinary nitric acid a rough, coarse ground is etched. On the other hand a beautiful, smooth surface is obtained by the slimy precipitation nitric acid method.

Figures 4 and 5 show microscopic enlargements ; one a rough, the other a smooth etched zincplate. The illustrations show the finished results in both cases.—Photographische Correspondentz.

The following cuts exhibit the great advantage secured by the employment of the Etching bath of V. Turati over the ordinary method.



Autotype. Hot Enamel Process. Nitric Acid Etching Bath, 15 minutes.



Autotype. Hot Enamel Zinc Method. V. Turati's plan, 3 minutes.

OPTICAL EFFECTS OF INTENSIFICATION.

CHAPMAN JONES, F.I.C., F.C.S., etc.

IN January, 1888, I published my first communication dealing with the mercury and ferrous oxalate method of intensification, pointing out its advantages. In January, 1890, in a paper read before this society, I dealt further with this and the sodium sulphite methods of intensifications. In January, 1893, I communicated to this society further details referring especially to the chemistry of various methods of mercurial intensification, and at the end of the same year these matters were more fully dealt with from a chemical point of view in a paper read before the Society of Chemical Industry. In April, 1894, before the Society of Arts, I referred, among other subjects, to the revival of the old suggestion to use an alkaline developer instead of ferrous oxalate to follow the mercuric chloride, and showed that such a method was quite unreliable. I have now the honor of laying before the society the results of an investigation into the optical effects of the ferrous oxalate and some of the other common methods of mercurial intensification, and it is satisfactory to be able to say that these results fully confirm the inferences that I had based upon the examination of the chemistry of these processes. In some cases indeed they go further, and more emphatically show that the ferrous oxalate method is the only kind of mercurial intensification that does not by its very nature give irregular effects.

The results that I have examined optically have reference to the treatment of the bleached image with (1) ferrous oxalate ; (2) ammonia ; (3) silver potassium cyanide ; (4) sodium sulphite. The nature of these results, taken in conjunction with the chemical details already published, leaves practically no room for doubt as to the effects of the other rarely used reagents, so that I did not consider that it would be worth the expenditure of the further time that would have been necessary to include these in this present work.

Ferrous Oxalate.—As the chemical effect of ferrous oxalate upon the bleached image is perfectly straightforward, simple and

regular, merely removing the chlorine from the double chloride of mercury and silver and leaving the metals, I expected that the optical effect would be regular also, and endeavored to determine its proportion. Messrs. Hurter and Driffield have shown that it is the opacity logarithms that must be regarded in such cases and not either the simple opacity or the transparency. I sought therefore to discover the figure that the opacity logarithms should be multiplied by to give the opacity logarithms of the plate after intensification. In the experiments I used plates of different speeds by two makers whose plates are very different in character, and also lantern plates of a slow kind. The original negatives were developed with pyro and soda, metol, and ferrous oxalate, and I deemed this a sufficient variety of conditions to justify my generalizations.

The following table shows my results :

Treatment.	Including all experiments.		Select series of experiments.	
	No. of experiments.	Average multiplier.	No. of experiments.	Average multiplier.
1st	87	1.46	56	1.43
2d	45	1.59	31	1.47
3d	4	1.45	4	1.45
Total	136	1.50	91	1.445

The experiments excluded from the figures of the last two columns are not excluded merely because thy are discrepant, but because for one reason or another they are not as reliable as the rest. Some of the excluded figures agree excellently with the average, but an unreliable series was of course rejected entirely. The reasons why some were deemed unreliable were the use of very slight deposits in which the liability to error of measurements was of necessity large, and the want of sufficient care in some of the earlier experiments in the development and washing. Indeed one or two experiments were done rather as a preliminary trial than as a serious attempt to determine the multiplier. The second and third treatments mean that the plate had already been intensified once or twice before.

The agreement of the opacity logarithms calculated by means of this multiplier, and those obtained by experiment, is shown in the examples given below.

1	2. Calculated.		3. Calculated.			4. Calculated.		
Original	One treatment.	1x1.45.	Two treatments.	2 x 1.45	1 x 1.45^2	Three treatments.	3 x 1.45	1 x 1.45^3
.14	.23	.203	.32	.333	.294	.44	.464	.427
.24	.34	.348	.50	.493	.504	.70	.725	.732
.44	.60	.638	.90	.87	.924	1.33	1.32	1.34
.76	1.04	1.10	1.60	1.51	1.60	2.53	2.32	2.32
1.06	1.49	1.44	2.44	2.16	2.23			
1.30	1.89	1.88	2.95	2.74	2.73			
1.46	2.15	2.12	3.25	3.12	3.07			
1 55	2.30	2.25	3.53	3.34	3.26			

$1.45^2 = 2.10$
$1.45^3 = 3\ 05$

This was a plate of ordinary rapidity developed with ferrous oxalate. Each exposure was double the preceding one.

The following was a lantern plate developed with pyro and sodium carbonate, and then washed two or three times in dilute caustic soda solution to get rid of a little staining matter in the plate that was present in spite of the presence of the usual amount of sulphite in the developer.

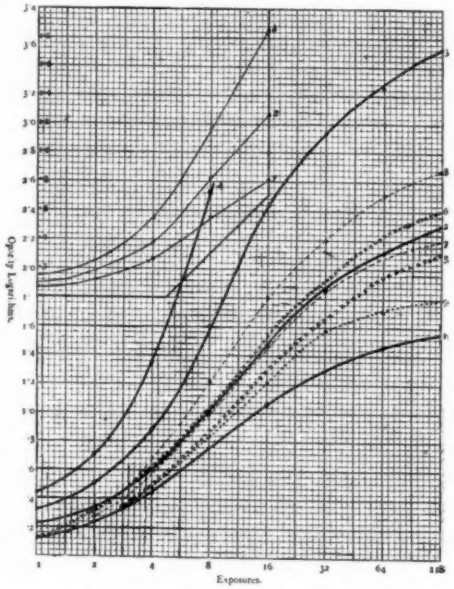
1.	2	Calculated.	3	Calculated.	
Original.	One treatment.	1 x 1.45	Two treatments.	2 x 1.45	1 x 1.45^2
.07	.10	.101	.15	.145	.147
.12	.17	.174	.23	.246	.252
.26	.37	.377	.54	.536	.546
.54	.82	.783	1.17	1 189	1.13
.81	1.27	1.175	1.84	1.842	1 70

The densest original square on this plate is of a marked yellow color, it is probable therefore that the opacity logarithm as estimated is too low, and does not fairly represent the amount of silver present. The calculated figures founded on this observation are both low, but an exact agreement appears as soon as the yellow color has gone, for the figure obtained experimentally for the second treatment exactly agrees with that calculated from the result of the first treatment.

It is, of course, possible to calculate the original condition of the plate from the results obtained after intensification. The figures are all opacity logarithms.

Original as measured.	Result of one intensification divided by 1.45.	Result of two intensifications divided by 1.45^2.
.07	.069	.071
.12	.117	.110
.26	.255	.257
.54	.565	.557
.81	.876	.876

The low figure obtained by measurement for the most dense square is here very marked. It is worth noting that the higher figure obtained from the intensification results gives a more even curve when the results are plotted, and this is additional evidence



1. Original.
2. $Fe\overline{Ox}$. Once.
3. $FeOx$. Twice.
4. $Fe\overline{Ox}$. Three times.
5. AmOH. Stronger.
6. AmOH. Weaker.
7. $AgKCy_2$. Longer.
8. $AgKCy_2$. Shorter.
9. Na_2O_2.

(*The Optical Effects of Intensification, by Chapman Jones, F.I.C., F.C.S., &c.*)

of its correctness. This method of intensification is thus likely to prove useful in getting at the real value of silver deposits that are not black.

There appears to be another reason why the densest part is sometimes inclined to be abnormally dense after intensification. It is a well known fact that partially reduced silver chloride is very dark in color. But on the other hand the white double chloride of silver and mercury is much more transparent than the metallic silver it is produced from.

When therefore the ferrous oxalate acts upon the bleached image it is probable that the density increased gradually to a point beyond the final density, because of the incompletely reduced silver chloride, and then diminishes in density till reduction is complete. I have obtained actual evidence that favors this supposition, but it is difficult to prove it, because many experiments may be made without happening to catch the plate at the exact stage when the density is excessive. When a solution of mercuric chloride is applied to a negative the first effect is a quite distinct darkening, and this is followed after a little by the bleaching. Obviously at first the chloride and the metal are both present. The partially reduced salts of silver that Carey Lea calls photo-salts have great depth of color. These facts confirm the supposition that metallic silver and silver chloride together in certain proportions are more opaque than the whole of the silver in the metallic form would be. If, therefore, the action of the ferrous oxalate is stopped immediately the image is blackened through, there is not unlikely to be an incomplete action in the densest part and consequently an excessive density. This accident appears to occur but rarely, and the way to avoid it is obvious. An incomplete washing away of the excess of mercuric chloride leads to a retardation of the action of the ferrous oxalate, and so favors the occurrence of this error.

To get exact results by intensification it is obvious that the negative must be free from the dark-colored products of the oxidation of the developer. The image should be of pure silver. The effect upon the result of a mixed or impure image cannot be predicted except in the most general terms. Acid liquids will fix

the coloring matter and lighten its color, while alkaline liquids will darken it and tend to dissolve and remove it. Ordinary hard water behaves as a weakly alkaline liquid because of the carbonate of lime that it contains. The best "clearing solution" that I know of, and I know it is a good one, is a weak solution of caustic soda. It must be weak enough not to injuriously affect the gelatine. Practically I find that about five drops of a ten per cent. solution to each ounce of water generally works well. The plate should be soaked in the solution for two or three minutes, and if the liquid darkens a fresh quantity is used. This is repeated until the solution ceases to become colored, and the negative is then well washed.

The only other precaution that appears to be worth mentioning that tends to the getting of exact results, is the soaking for two or three minutes in hydrochloric acid, about one to sixty of water, before applying the mercuric chloride. The mercuric chloride is of course itself acidified as usual. It is necessary to get quite rid of alkalinity before the mercury solution is applied, otherwise mercury compounds will be deposited in the film.

A microscopical examination of the results of intensification hardly leaves room for doubt that the increased opacity is due at least partly to an enlargement of the particles, though it is difficult to prove this by measurement as they are of such various sizes in the same plate. Taking the specific gravities of mercury and silver as 13.5 and 1.05 respectively, and the bulks of equal weights as inversely proportional to the specific gravities, and multiplying these bulks by the weights involved, we find an increase in bulk of each particle of silver in the proportion of 2 to 5 by this process of intensification, assuming that the mercury and silver associate themselves together without change of bulk. Taking the square of the cube roots of these figures to get the sectional areas, we get a ratio of 1 to 1.84. The ratio found by experiment is, as above stated, as 1 to 1.45. But the calculated figure is based on the assumption that the mercury and silver combine without alteration in their bulks, and it is stated on good authority that there is considerable contraction in volume when these two metals combine. I hope to determine the specific

gravity of the amalgam to see whether the experimental figure agrees with that obtained by calculation on the assumption that the effect is due to a simple increase in the size of the particles.

Ammonia.—I have not yet worked out the exact chemical changes that take place when ammonia is used to blacken the whitened image, but I have certainly proved that the change is not uniform. This want of uniformity is amply confirmed by the optical method of examination. The following table shows the multipliers of the opacity logarithms obtained in four series of experiments, the opacity logarithms of the original plates ranging from .14 to 1.49.

Same strength of dilute ammonia	1 minute . . .	1.0	1.0	1.0	1.23	1.33	1.62	1.68	1 62
	15 minutes . .	1.0	1.0	1 07	1.24	1.33	1.46	1.43	1.37
Same time of application.	weak	1.0	1.33	1.38	1.35	1.46	1 48	1 53	1.54
	strong	1 0	1.0	1.04	1.21	1.30	1.35	1.39	1.40

The figures show unmistakably that the action is uncertain, that there is a reducing or thinning action as well an an intensification, and that this thinning of the image increases as the time of application, or the strength of the ammonia increases. I pointed out many years ago that a reducing or thinning action of this direct character could not be proportional in its effects, and this was afterwards confirmed by Messrs. Hurter and Driffield. An intensifier that reduces as well as intensifies is generally called "clean working," but such cleanliness is no recommendation in negatives of half-tone subjects, especially as one can never know how much of it he is going to get.

Silver Potassium Cyanide.—This is another "clean working" reagent and consequently uncertain and uncontrollable. It is obvious from the following figures (multipliers of the opacity logarithms) that prolonging its action tends to reduce the density, but the same effect is not reproducible except by accident. The effect is irregular and the chemical changes that take place and have already been described make it impossible to hope that it can ever be otherwise. It may be added that the images resulting from the use of this reagent, and also from ammonia are liable

to subsequent change. Probably they never remain without change.

Treatment.								
Short	1.12	1.26	1.51	1.62	1.70	1.71	1.74	1.71
Long	1.00	1.17	1.32	1.34	1.40	1.44	1.41	1.42
Short	1.43	1.70	1.72	1.77	1.91	2.06	2.16	2 04
Long	1.43	1.65	1.65	1.68	1.56	1.76	1.79	1.77

Messrs. Hurter and Driffield in their original paper read before the Society of Chemical Industry in May, 1890, describe the results of two experiments with this intensifier, and their results tend to confirm what I have stated, although they infer from their experiments that the ratio of the opacity logarithms is not altered. The range of density that they dealt with was too small to show the variation, but the average multiplier obtained in the two experiments is different, 1.95 and 1.82, although it is probable that they did not of set purpose vary the treatment. The opacity logarithms of the original plates in my experiments ranged from .16 to 1.44 in the first pair of experiments, and from .07 to 1.31 in the second.

It follows from these results that if it is desired to intensify the negative of a black and white subject, to make the one part dense and keep the other parts clear, and if the negative is not to be preserved for longer, say, than perhaps a few weeks or a few months, the mercury and ammonia, and the mercury and silver cyanide methods are exactly suitable. For keeping the clear parts clear, ammonia is especially to be recommended, as it does not intensify the thinnest part of the negative at all (or it intensifies and then reduces them) and in some cases I have observed that the thinnest parts have finally been, if anything, rather reduced in density than otherwise by the operation. But examination of these same plates a year later showed, without doubt, that the thinnest parts had spontaneously increased in density.

It is rather risky for a mere investigator to offer advice to practical people on points that they have almost hourly experience with, but if a photo-mechanical worker with gelatine plates asked my advice as to the intensification of black and white negatives, I should unhesitatingly advise mercury and ammonia rather than

the silver cyanide or any other method. But it must be ever remembered that the resulting image is liable to after changes.

Sodium Sulphite.—I have previously, from the results of the chemical changes produced by this intensifier, advised it as safe, though of little use, because the increase of density that it gives is so small. I find, however, that it is not safe, that it alters the ratio of the opacity logarithms, and the chemistry of its action shows how this is, though alone it would not have justified the condemnation of the method.

The following figures are the average of two experiments on plates with opacity logarithms ranging from .15 to 1.51, and are as before the multipliers of the logarithms :

1.0 1.0 1.10 1,14 1.18 1.21 1.19 1.17

Here as with ammonia and potassium silver cyanide there is a marked reducing as well as an intensifying action which leads to no increase of density in the thinner parts, and an increasing increase towards the denser parts. The ratio of the opacity logarithms is quite altered.

The effect of this intensifier is to replace half the silver of the image with rather less than an equal weight of mercury (216 to 200) and as the specific gravity of mercury is greater than that of silver and there is contraction when mercury and silver combine, the total bulk of the resulting matter that forms the image must be considerably less than that in the original plate. It is curious therefore that there should be any increase of opacity at all, and it must apparently be due to a change in the disposition of the particles. This may be the cause of there being no increase of opacity in the lower densities, the disposition of the particles being different there.

But I have shown in previous communications that the sodium sulphite solution which contains half the silver of the original image, when left in contact with the solid product of the reaction causes a partial solution of the mercury and deposition of silver instead of it. Now as the exchange of silver for mercury has increased density, it is not surprising that a change back again of some of the mercury for silver should give a diminution of

density. I fear therefore that this reagent like the ammonia and silver potassium cyanide, causes a reduction of density after the intensification effect, and is like them unreliable and uncertain.

The results of these methods of intensification have been plotted as curves for their more ready comparison. The densities of the original plates were not in all cases quite identical, but there was not much difference, and the results have for the purposes of these curves been proportionally adjusted to make them all comparable together.

Mr. F. E. Ives said he had made considerable use of the mercury-ammonia method of intensification, and had observed the failure to intensify the weaker details, which was, as Mr. Chapman Jones said, for some purposes an advantage and for others a disadvantage. He used the method not so much for increasing the density of negatives, because he had no difficulty in obtaining the required density in the first place, but as a means of compensating to some extent for the shortened scale of gradation in the photographic process. Most photographic plates—especially the slower ones and some color sensitive plates—when exposed sufficiently to bring up the detail in the shadows, over exposed the high lights, the scale of gradation being not the same as the gradation of light and shade to the eye. In order to get up the details in the shadows, he sometimes found it necessary to expose until the high lights were over-exposed, and the gradations became flattened out; he therefore exposed for a period just short enough not to produce too much over-exposure and flattening of the gradations in the lighter parts, and then intensified superficially, placing the plate, after swelling the gelatine as much as possible in cold water—in a weak solution of bichloride of mercury for a time just sufficient to allow the thinner details only to be whitened through to the back. In that way the details in the shadows were fully intensified, while the density of the thicker deposits was only increased by from ten to fifteen per cent. He found this plan particularly useful in photochromoscope negative work, in which it was of the utmost importance to get the scale of gradation as near as possible to that of the eye, and, although it was not a scientifically exact method of intensification, one could at least be certain that the results were nearer to the truth after such treatment. He had proved this experimentally. With regard to the permanence of negatives intensified with ammonia, he had intensified wet collodion negatives by that method, and they quickly changed, but he found that gelatine dry plates kept well when similarly treated; in fact, he did not think he ever lost one, or saw one go noticeably wrong, if a trace

of ammonia was left in the film, and the negative varnished, when dry with celluloid varnish. These observations did not discount the importance, for some purposes, of a method which could be relied upon to intensify fully without changing the relations of the different gradations, and even for such work as he had described, it was evident from what Mr. Chapman Jones had said, that ferrous oxalate might be better than ammonia.

Mr. H. T. Malby had had some trouble in connection with intensification with ferrous oxalate, in consequence of the washing water being saturated with lime, which caused such discoloration and uncertainty that he was compelled to abandon the process; and he asked Mr. Chapman Jones' opinion as to the best procedure under those circumstances.

The Rev. F. C. Lambert asked whether the printing values of the intensified negatives agreed with the readings obtained by Mr. Chapman Jones. He had made some experiments with regard to intensification, and found that the question of color had a much greater influence upon the printing value than he had imagined, negatives which appeared to have been only slightly intensified having apparently a greater light-resisting power than he had supposed. Had the author of the paper made any investigations bearing upon this point, and did he find that the printing values were strictly or fairly comparable with the opacities or densities of the negatives?

The President inquired whether the iodide of mercury treatment, without subsequent re-development, was fairly permanent? Some time ago, when photographing some old gold objects, he intensified a very thin negative with iodide of mercury until it assumed a sort of olive green color, but when dry it had a bright tint and gave most brilliant prints.

Mr. W. E. Debenham asked whether Mr. Chapman Jones had included in his experiments the method of intensifying with iodide of mercury followed by Schlippe's salt. The system referred to by the President was in use some years ago, but it was worse than uncertain, and was almost certain not to be permanent. The use of Schlippe's salt somewhat increased the density given by the mercuric iodide, so that it was necessary to stop the action of the latter before the attainment of the full result required. If Mr. Chapman Jones had not tried this process, must he not modify his statement that no method other than ferrous oxalate gave permanent results or was to be commended?

The Assistant Secretary asked whether, so far as Mr. Chapman Jones was aware, it was possible by means of intensification to in any way correct the crowding together of the gradations in what were known as the under-exposed and over-exposed portions of the negative? Whether any of the processes, which were defective in the straight portion, were defective in an advantageous manner, in the under- and over-exposed parts?

Also, whether, in every case, so far as he had dealt with them, the color of the deposit was such as to lead one to suppose that the remarks of Messrs. Hurter and Driffield, as to color of deposit, held good for these intensified deposits? He further asked whether the curves shown were directly comparable with Messrs. Hurter and Driffield curves?

Mr. Chapman Jones confirmed Mr. Ives' remarks as to partial intensification, but said the great aim of his experiments had been not to do partial work, because partial intensification was sure to upset the ratio of densities obtained by development. Partial work might be made to produce many different results, but was always uncertain. He had endeavored to find a method which might be relied upon to give a certain result. It was quite easy to avoid the difficulty arising from the presence of lime in the washing water, by soaking the plate in distilled water before and after applying the oxalate; if distilled water was not available, its equivalent could be produced by adding ammonium oxalate to tap water, and allowing the lime precipitate to settle down; but the oxalate of lime on the negative would have no printing value if the negatives were varnished, or it might be removed by dilute acid. Of course, colored deposits might not give a printing value equivalent to the visual readings, but he had sought to obtain not colored deposits, but pure black or grey, in which case the action would be the same for any printing process as visually. He used iodide of mercury many years ago, but the negatives changed to a sickly yellow, and he had never tried to print from them afterwards. For scientific work he wanted something that did not change. Schlippe's salt, as Mr. Debenham had said, gave too great an effect when the action was carried right through the film; it could therefore rarely be used other than partially, thereby upsetting the gradation and rendering it impossible to secure a definite result. He had left this method outside his experiments for this reason. The use of a reducing agent separated out the densities of the thinner deposits, but one could not reduce without altering the ratios. With regard to the curves, each exposure was double the preceding exposure, and to that extent the diagram was comparable with Messrs. Hurter and Driffield's curves; but the vertical scale was not comparable, being reduced to one-half to avoid an inconvenient steepness.

—*The Photographic Journal.*

HISTORY OF THE HALFTONE DOT.

(Continued from July number.)

THEORETICAL PROPOSITION.

As the result of my experiments I put forward the following proposition as my theory of the working of the screen, and I hope to be able to show you, by means of the lantern microscope, some slides in evidence of that theory :—

1. That in making a half-tone negative, the holes of the screen are little windows allowing a part of the picture to pass through equal to their size. With a sufficiently large hole and a normal exposure there would be a little square of the picture visible. But
2. That when the exposure is prolonged and the screen-hole small, the latter acts the part of a pinhole lens as well as its functions as a window, and photos the light-spot of the diaphragm, the image of which blackens over the little square of the picture, but if the latter happens to be a bit of the shadows it stops the illumination of the pinhole image, and little or no action takes place. According to the color of the bit of picture so the dot is strong or feeble.
3. That the screen-hole acting as a pinhole must photograph the shape of the spot of light, and render it as an image on the sensitive plate larger or smaller according to the brightness of the light and the distance of the screen from the plate. That it is a pinhole image is also proved by the reversal.
4. But the pinhole image is not a sharply defined outline of the diaphragm because the pinhole does not see the diaphragm as a sharply defined image. It sees all the corners rounded off by diffraction and renders the image so (a central black spot in the diaphragm is entirely neutralized by diffraction and interference, and becomes really a bright spot on the plate). A small aperture is so much encroached upon by the diffraction rings and fringes that it looks really smaller than it is, and when it is transmitted through the screen further diffraction fringes make it smaller still, so that the image becomes really smaller than the screen-opening.
5. Diffraction thus overcomes any obstructive action of shadow and penumbra, giving sharply defined images even though the diaphragm be large and the screen-distance considerable.

Mr. Gamble exhibited a series of slides showing the effect of increasing the exposure and increasing the diaphragm, and of using too large a diaphragm or too great a screen-distance ; also the result obtained by the use of a gauge screen. Another showed that by placing the ruled screen in contact, or nearly in contact, with the plate and using a small stop, the

dot would be the size and shape of the screen-opening. He relied upon this ; compared with the fact that with a much smaller stop at a greater distance he could get a dot which was not the size or shape of the screen-opening, as an evidence of diffraction. These different results were evidence that if the effects were not due to the action of the screen in throwing a shadow, because if one worked on that theory there would at the increased distance be no shadow at all, but simply a blaze of light, unless a very small stop was used ; and then if the small stop were employed the result according to that theory would be a dot the size and shape of the screen aperture. The fact that this was not so in practice proved that there was some other effect than that of casting a shadow. When using a square stop the dots were always a little rounded off at the corners, and for this reason it had become the practice to slightly extend the corners of the aperture so as to counteract the tendency to rounding off. He did not trouble a great deal about excessive sharpness of the dot in dry plate negatives, which he found would print as well as extremely sharp wet plate negatives ; it was only a matter of degree in exposure. The irregular grain produced by stippling with a spur roulette in a ruling machine in different directions on a ground laid on glass was illustrated, Mr. Gamble remarking that he did not think irregular grained screens could ever give such brilliant results as cross-lined screens, owing to the fact that the grain, being irregular, varied in size, and there could never be equality of conditions.

Mr. Dawson pointed out that, owing to the thicknesses of the glass forming the screen, the question of refraction constituted a material factor in the consideration of the subject, and in plates of large size the actual area of the picture on the negative is not materially the same as it would have been if no screen had been interposed. Again, the size of the dot had been spoken of as if it were only a matter of screen-distance (*i.e.*, diffraction and penumbra). But the law well known in ordinary photography also applied here, that by continual exposure the highly affected parts on a negative (in this case the dot) encroach upon the parts adjacent less highly affected, such dot by continued exposure becoming larger as well as denser. (In this debate the dot referred to is always the negative dot and not that which appears in the print.)

FIRST-RATE portraiture will always be rare, although it is only such that is likely to command spectators on the sole ground of its merits as art. It demands an eye for form, light and shade, and a complete cultivation of design, in which too many fashionable limners are sadly, but, it would seem, unconsciously, deficient.

THE ROYAL PHOTOGRAPHIC SOCIETY—FORTY-SECOND ANNUAL EXHIBITION, 1897.

ADMISSION.

THE exhibition will be inaugurated on Saturday, the 25th of September, by a private view, followed in the evening by a conversazione.

The exhibition will remain open daily (Sundays excepted) from Monday, the 27th of September, until Saturday, the 13th of November, from 10 a.m. till 5 p.m. It will also be open on Monday, Wednesday, and Saturday evenings, when lantern slides may be shown. Admission, one shilling. Season tickets will also be sold, price, five shillings.

MEDALS.

Medals will be placed at the disposal of the judges. Exhibitors may state whether they wish their exhibits to go before the judges in the art or the technical section, or both. The exhibition will be conducted according to the rules adopted at the Conference of Judges.

The under-mentioned gentlemen have been elected by the members of the Society to act as judges, and have consented to serve:

Art Section.—F. P. Cembrano, Jun.; B. W. Leader, A.R.A.; Sir J. D. Linton, P.R.I.; G. A. Storey, A.R.A.; W. L. Wyllie, A.R.A.

Technical Section.—Captain W. de W. Abney, C.B., D.C.L., F.R.S.; Chapman Jones, F.I.C., F.C.S.; Andrew Pringle, F.R.M.S.

GENERAL REGULATIONS.

Photographs.—Each exhibitor must fill up the entry form supplied by the Society, and send it to the Secretary, Royal Photographic Society, 12, Hanover Square, London, W. Information as to particulars should be given with any work produced by a special process of the exhibitor.

At the back of each frame must be written the name and address of the exhibitor, with the title or description of the photograph, and the number (if there are more than one) to which it refers in the entry form. Tho front of the frame or picture may have the exhibitor's name, and title of picture, neatly inscribed upon it, and these only. To avoid damage to other frames, it is requested that all frames have sunken backboards with the fastening nails not projecting, and the backs covered with thick brown paper.

Lantern slides will not be eligible for award unless both the negatives and slides are the work of the exhibitor. Frames will be provided for them.

Negatives, transparencies, photo-mechánical prints, stereoscopic work, photographs of purely scientific interest, and photographs colored by mechanical means will be admitted. Photographs in Oxford frames, photographs already shown in any public exhibition within the London postal

district, and photographs colored by hand are not eligible for admission. Excessive breadth in frames or mounts, silvered or oval frames, or projecting mouldings are undesirable, and may prevent photographs from obtaining the position they otherwise merit. It is generally desirable that each photograph be separately framed.

All working up of photographs by hand, except mere spotting, is undesirable, and may cause the rejection of the exhibit.

Apparatus.—Each exhibitor must fill up the entry form supplied by the Society. A removable card must be attached to the exhibit containing the name of the exhibitor and the number to which it refers in the entry form. Attention is requested to this regulation, as, without it, the description of the apparatus may not appear in the catalogue. The exhibitor should fasten on each exhibit a small label containing his name only.

No apparatus will be admitted that has been shown in the Society's previous exhibitions unless it has some new detail. All apparatus must be concisely described, and a list of the novel details given. Apparatus that has already been shown at London exhibitions may be refused.

Sales.—The prices of the exhibits will be published in the catalogue so far as they are furnished by the exhibitors. Exhibits not priced on the entry form will be indicated as being "not for sale." Fifteen per cent. commission will be deducted on sales.

Foreign and Colonial exhibitors are invited to contribute. They will not be charged for wall space. The Society will provide frames during the exhibition for approved photographs.

Reception of Exhibits.—Exhibits sent by carrier must be carriage paid, and addressed to the Secretary, Royal Photographic Society, 12, Hanover Square, London, W., and must arrive on or before Wednesday, Sept. 1st.

In intensification, the value of a preliminary clearing of the negative is not generally appreciated. Frequently the covered-over portions are more clogged up by the process and the results are anything but satisfactory. If a brief immersion in a weak bath of ferric chloride and citric acid is had recourse to, the great improvement in the after intensification will surprise the operator. Ferric chloride, 30 grains; citric acid, 60 grains; water, 1 pint. The preliminary bath is also a hypo eliminator, and hence a valuable adjunct in connection with mercury.

SILVER INTENSIFICATION OF GELATINE PLATES.

W. B. BOLTON.

IT is rather surprising, to those who have ever tried it, that silver intensification is a thing practically unknown in connection with gelatine plates; indeed, by the great majority of users of those plates, it is supposed to be an impossibility. So far is this from being the case that I have personally long been of the opinion that it is far away the best method that exists, when the negative is worth the trouble; not that it involves a vast amount of extra labor, or unheard-of care, but it requires a little more of both those commodities than the every-day amateur is likely to bestow upon exposures that do not matter much if they result in negatives or spoilt plates.

But, in serious work, I repeat, I am astonished that more use is not made of this method, at any rate than we hear of; for, whenever intensification is spoken of, it is almost invariably mercury in some form that is mentioned. The reason, or perhaps I should say the reasons, for this neglect are not far to seek. In the early days of gelatine plates, silver intensification was the natural resource where intensification was needed, as it had been in the days of collodion, whether wet or dry; but that was at a period when every one was quite familiar with silver intensification, and when gelatine plates were principally used by amateurs who were thoroughly accustomed to dry plate work. If we turn back to the "Almanacs" of fifteen years ago we shall find several formulæ for this method of intensifying gelatine plates, and when we find such workers as Wratten and Wainwright, and the late J. Dudley Radcliffe—to mention only two names that I remember—recommending that form, we may be pretty sure that it is somewhat more than merely feasible.

But when the rush came, and gelatine plates were in the hands of every one—amateur and professional—pyro and silver, or iron and silver, rapidly fell out of use, simply because it would not work under the conditions forced upon it. It was a long time before the users of the new plates recognized the difference between gelatine and collodion, and the necessity for a far longer washing

of the films at every stage. The old dry plate workers who generally used hypo for fixing, too, knew from experience the amount of washing that even a collodion film requires, after hypo has been used, before it is fit for silver intensification, and they acted accordingly ; but the professional, accustomed to cyanide, was perhaps not so careful on that point. At any rate, from one cause and another, silver intensification proved impracticable, and perhaps no wonder. Now that a new generation has sprung up, training in the old school, and working under its traditions, it is easy to explain why the easier mercurial methods still hold the field, in spite of the, at any rate, dubious character they bear for stability. The results obtained with silver are far beyond suspicion of change as old collodion negatives, although it has been said that the action of the silver upon the gelatine must eventually result in its discoloration. But this is a complete fallacy, such a result would only follow careless manipulation, and I can vouch for the stability of silver-intensified gelatine negatives for ten years or so, as I cleaned off, about three years ago, a number of negatives at least that age, that were as free from stain or change as when first made.

The weak point of mercurial intensification is that its utility is limited within very narrow boundaries. If a negative is thin and veiled, it intensifies the veil as much, or, proportionately, more than the picture itself. If, on the other hand, the image is generally weak, but clean, or weak principally in the shadows, the intensification seems to go almost entirely to the high lights and parts that are already fairly dense, leaving the weaker portions that require it most practically untouched, and only increasing the contrast in hardness. A well-graded image that only wants a little more general vigor is really the only one that mercury will give a really satisfactory result with, and even then frequently will do as well with careful printing as with intensification.

But with silver the action can be regulated to suit the character of the original image ; the density can be piled on to the picture generally, or it can be made to pick out the high lights, and give them " sparkle " if that is what is required, or again can be made to act as a sort of continued development, bringing up

the weak shadows while adding but little to the density of the lights. In fact it affords as many opportunities for modifying the result as does the original development, and this can certainly not be said of any of the simply chemical forms of intensification.

The modified method introduced by Mr. J. B. B. Wellington, and alluded to in these pages a few weeks back (May 7, p. 294), avoided many of the troubles that surround the ordinary acid pyro and silver plan, from which it differs essentially in being an alkaline process. The solution itself is, in fact, a mixture of the developer and fixing bath with free silver, a happy " hotch potch " that entirely obviates any risk of staining from a chance admixture of any of the different solutions from imperfect washing. The effect of this strange mixture, however, is admirable, and there is only one fault to find with the process, and that is its comparative expense, although, as pointed out in the article referred to, this may be minimized when a number of negatives have to be treated ; but, when only an occasional one has to be intensified, we have to fall back for convenience upon the acid method, with all its alleged faults.

All that is really necessary is to get rid of the hypo and its combinations. The negative must be thoroughly fixed, i.e., the whole of the unaltered bromide must be converted into the soluble hyposulphite, and this must be completely removed by washing, not by " hypo eliminators," although a subsequent application of the alum and hydrochloric acid clearing solution is advantageous, if not absolutely necessary. The hydrochloric acid in this, I fancy, acts in much the same way as the combined acid in the combined clearing and intensification method referred to. At any rate, when it is used, there is not the slightest difficulty in getting any amount of density with shadows, at least as clear and colorless as at the start. Using weak aqua regia, or a similar mixture of nitric and hydrobromic acids, the clearing of the shadows goes on simultaneously with the intensification, and, if the rest of the operations are properly performed, this method is undoubtedly the best for these over-exposed veiled negatives.

" British Journal of Photography."

BARGAIN LIST.—AUGUST, 1897.

PORTRAIT CAMERAS.

[For Lenses see Special List.]

1—11x14 Scovill Port. Camera, Bonanza holder, ... $35 00
1—11x14 Anthony Port. Camera, Benster holder, ... 30 00
1—14x17 D. S. B. Portrait Camera, 40 00
1—5x8 Wet Plate Stereo. Camera, 3 holders, ... 20 00

VIEW CAMERAS.

1— 6½ x 8½ Blair Rev. Back Camera, Beck lens, 6 holders and tripod 35 00
1—5x7 Eastman R. B. Camera, 3 Holders, Steinheil lens, tripod, 35 00
1—5x7 Ideal, 2 extra holders and special case, ... 19 00
1—22x28 American Opt. Co. View Camera 75 00
1—11x14 Flammang R. B. Camera, 4 holders, tripod, Eury-scope lens. Prosch shutter, . 100 00
1—5x8 Blair Lucidograph, . . . 4 00
1—4x5 New Model, ... 6 00
1—8x10 Blair, Rev. Back, good order, ... 18 00
1—5x8 Wet Plate Stereo Camera, 1 pair Darlot lenses, 1 5x8 Darlot lenses, ... 10 00
1—4 x 5 New Model Outfit, . . 6 50
1—6½x8½ Novelette Camera, two (2) extra Holders, Beck R, R. Lens, Canvas Case, in good condition. Cost $107.00. Will sell for 60 00
1—4x5 New Model Imp. Camera, Wray lens, 6 extra holders, . 34 00
1—5x8 Genessee Outfit, 3 extra holders 13 00
6—⅝ Scovill light-weight film holders, each 1 00
1—Takiv Magazine Camera, . . 2 50
1—Peep-a-Boo Camera, ... 2 50
1—5x8 Blair Camera, with 6½x8½ extension and 12 holders, . . 25 00
1—6½x8½ View and 2 holders . 8 00
1—5x8 New Model Camera, . . 10 00
1—5x8 Blair Single Swing View Camera 10 00
1—6½ x 8½ American Optical Co.'s View Camera, ... $15 00
1—5x8 Boston Rev. Back Camera, new, with Orthoscope lens, . 28 00
1—Student Camera, complete . . 1 50

HAND CAMERAS.

1—Bull's Eye '97 and Case . . 8 00
1—4x5 Cycle Poco R. R. lens, 6 holders, ... 18 00
1—No. 4 Kodak, good as new, . 22 00
1—Night Hawk Camera, . . . 3 00
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